AMENDMENTS TO THE CLAIMS

Please cancel claims 2 and 14 without prejudice or disclaimer and amend claims 1, 3, 5-8, 11, 13, 15, 17-20, and as follows:

1. (currently amended) A method of forming a copper wiring in a semiconductor device, comprising:

~~a first step of~~ providing a substrate in which a damascene pattern is formed in an interlayer insulating film;

~~a second step of~~ forming a copper anti-diffusion conductive film and a copper layer on the structure including the damascene pattern;

~~a third step of~~ forming a copper wiring in the damascene pattern by means of a chemical mechanical polishing process, wherein the chemical mechanical polishing is performed until a top surface of the copper wiring is concave from a top view and the top surface of the copper wiring has a lowermost portion disposed below a top surface of the interlayer insulating film ~~the surface of the copper wiring is lower than the surface of the interlayer insulating film; and~~;

performing an annealing process to convert the concave top surface of the copper wiring to a convex top surface; and

~~a fourth step of~~ forming a copper anti-diffusion insulating film on the entire structure including the convex top surface of the copper wiring.

2. (canceled)

3. (currently amended) The method as claimed in claim ~~2~~ 1, further comprising ~~the step of performing~~ a cleaning process after the ~~step of~~ performing of the chemical mechanical polishing process.

4. (original) The method as claimed in claim 3, wherein the cleaning process is performed using a cleaning agent containing nitric acid so that the surface of the copper wiring is further lower than the surface of the interlayer insulating film.

5. (currently amended) The method as claimed in claim ~~2~~ 1, wherein the annealing process is performed ~~using~~ in an inert gas atmosphere such as N_2, Ar, H_2 or He or a ~~mixed gas of them~~ at a temperature in the range of 100°C to 500°C.

6. (currently amended) The method as claimed in claim ~~2~~ 1, wherein the annealing process is performed ~~using~~ in an inert gas atmosphere of N_2, Ar, H_2 or He or a mixture thereof ~~mixed gas of them~~, or in a vacuum, ~~state~~ and at a temperature in the range of 200°C to 700°C for 1 to 5 minutes ~~in a rapid thermal annealing process~~.

7. (currently amended) The method as claimed in claim ~~2~~ 1, wherein a plasma processing is further performed between the forming of the copper wiring and the forming of the copper anti-diffusion insulating film ~~third step and the fourth step~~.

8. (currently amended) The method as claimed in claim 7, wherein the plasma processing is carried out in an atmosphere selected from the group consisting of ~~using a mixed gas containing~~ a mixture of nitrogen and hydrogen, ~~a gas of a series of~~ ammonia, ~~or a mixed gas of~~ and a mixture of hydrogen~~/an~~ and inert gas not containing nitrogen ~~as an atmosphere gas~~ and at a temperature in the range of 100°C to 350°C.

9. (original) The method as claimed in claim 1, wherein the copper anti-diffusion insulating film is formed by covering a material having a copper anti-diffusion property and a good fluidity property by means of a spin-on-deposition method, and then performing an annealing process for the material.

10. (original) The method as claimed in claim 9, wherein the copper anti-diffusion insulating film is formed using materials such as methyl, benzochlorobutane, polyimide, arylether and hydrogen silsesquioxane, which contain Si, C and N in a type of a sol or gel.

11. (currently amended) ~~The~~ A method as claimed in claim 9, wherein the annealing process is performed ~~using~~ in an atmosphere of an inert gas such as N_2, Ar, H_2 or He or a ~~mixed gas of them~~ a mixture thereof at a temperature in the range of 100°C to 500°C.

12. (original) The method as claimed in claim 9, wherein the annealing process is performed in a vacuum state at a temperature in the range of 100□ to 500□.

13. (currently amended) A method of forming a copper wiring in a semiconductor device, comprising:

~~a first step of~~ providing a substrate in which a damascene pattern is formed in an interlayer insulating film;

~~a second step of~~ forming a copper anti-diffusion conductive film and a copper layer on the structure including the damascene pattern;

~~a third step of~~ forming a copper wiring by means of a chemical mechanical polishing process, wherein ~~the surface of the copper wiring is lower than the surface of the interlayer insulating film; and~~ the chemical mechanical polishing is performed until a top surface of the copper wiring is concave from a top view and the top surface of the copper wiring has a lowermost portion disposed below a top surface of the interlayer insulating film;

performing an annealing process to convert the concave top surface of the copper wiring to a convex top surface; and

~~a fourth step of~~ forming a selective copper anti-diffusion conductive film on the convex top surface of the copper wiring.

14. (canceled)

15. (currently amended) The method as claimed in claim ~~14~~ 13, further comprising ~~the step of~~ performing a cleaning process after the ~~step of~~ performing or the chemical mechanical polishing process.

16. (original) The method as claimed in claim 15, wherein the cleaning process is performed using a cleaning agent containing nitric acid so that the surface of the copper wiring is further lower than the surface of the interlayer insulating film.

17. (currently amended) The method as claimed in claim ~~14~~ 13, wherein the annealing process is performed using an inert gas atmosphere such as N_2, Ar, H_2 or He or a ~~mixed gas of them~~ mixture thereof and at a temperature in the range of 100°C to 500°C.

18. (currently amended) The method as claimed in claim ~~14~~ 13, wherein the annealing process is performed using an inert gas atmosphere of N_2, Ar, H_2 or He or a ~~mixed gas of them,~~ mixture thereof or in a vacuum state and at a temperature in the range of 200°C to 700°C for 1 to 5 minutes ~~in a rapid thermal annealing process~~.

19. (currently amended) The method as claimed in claim ~~13~~ 14, wherein a plasma processing is further performed between the ~~third step~~ forming of the copper wiring and the ~~fourth step~~ forming of the copper anti-diffusion conductive film.

20. (currently amended) The method as claimed in claim 19, wherein the plasma processing is carried out ~~using~~ in an atmosphere of a ~~mixed gas containing~~ mixture of nitrogen and hydrogen, ~~a gas of a series of~~ ammonia, or a ~~mixed gas~~ mixture of hydrogen~~/an~~ and inert gas not containing nitrogen ~~as an atmosphere gas~~ and at a temperature in the range of 100°C to 350°C.

21. (original) The method as claimed in claim 13, wherein the selective copper anti-diffusion conductive film is formed within the damascene pattern without causing a step with the interlayer insulating film.

22. (currently amended) The method as claimed in claim 21, the selective copper anti-diffusion conductive film is formed using a ~~metal~~ material having a high melting point ~~such as W, Ti, Ta, etc. or a compound such as Ni, Co, P, B, etc.~~ by means of a selective electroless plating method.

23. (original) The method as claimed in claim 21, the selective copper anti-diffusion conductive film is formed by means of a selective chemical vapor deposition (CVD) method.

24. (currently amended) The method as claimed in claim 13, the selective copper anti-diffusion conductive film is formed using a ~~metal~~ material having a high melting point ~~such as W, Ti, Ta, etc. or a compound such as Ni, Co, P, B, etc.~~ by means of a selective electroless plating method.

25. (original) The method as claimed in claim 13, the selective copper anti-diffusion conductive film is formed by means of a selective chemical vapor deposition (CVD) method.